OPEN FILE 80- 542 MAP
SHEET 2 OF 2

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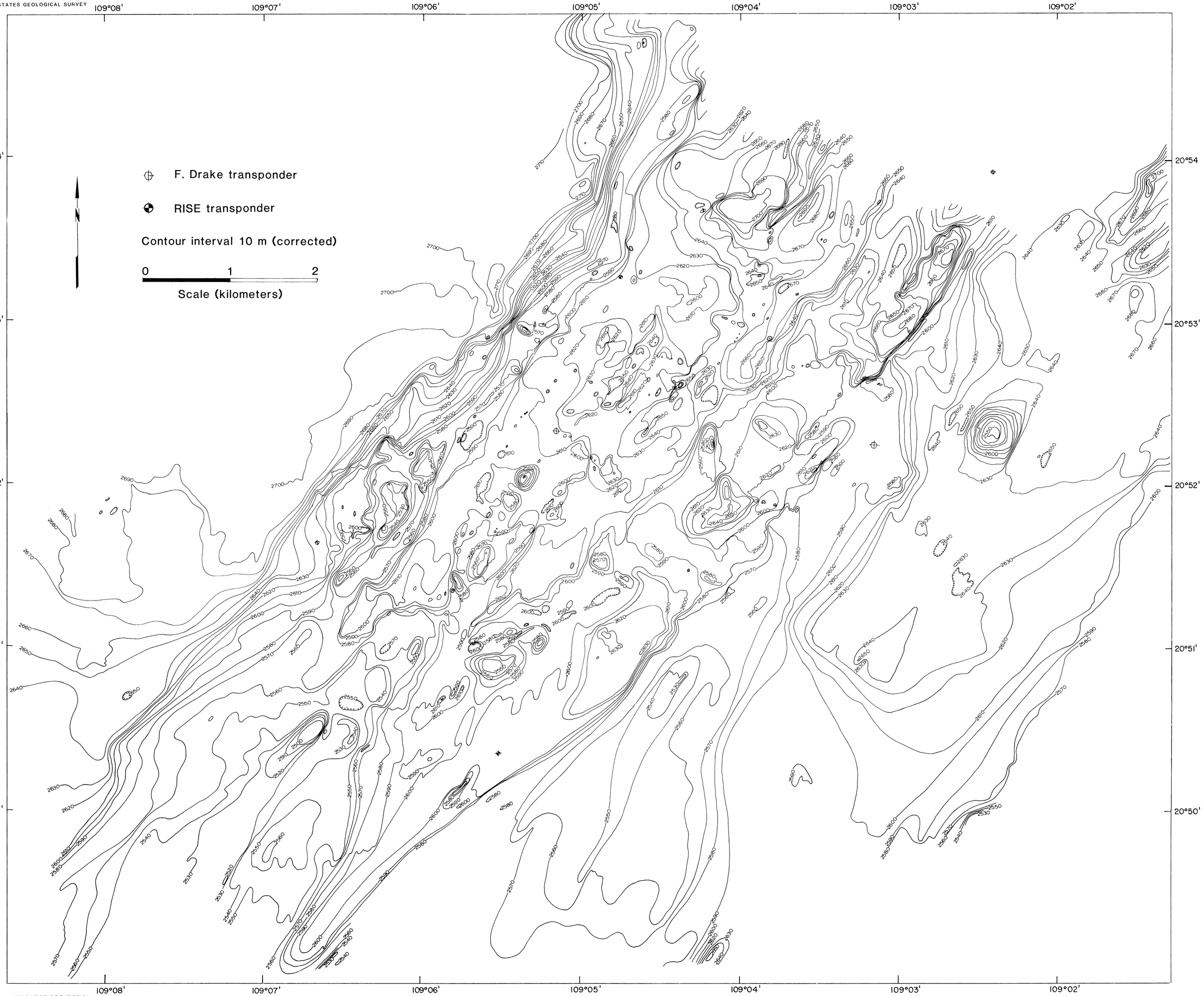

FINE-SCALE BATHYMETRY USED FOR SUBMERSIBLE STUDIES OF THE EAST PACIFIC RISE

by

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OPEN-FILE REPORT
This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature.

The East Pacific Rise (EPR) located in the mouth of the Gulf of California between the Rivera and Tamayo fracture zone, is a medium-rate spreading center expanding at 6.2 cm/yr (Klitgord et al., 1972; Fig. 1). The crest of the EPR near 21° N latitude exhibits subdued abyssal-hill topography with local relief generally less than 150 m (Fig. 2). A zone of active volcanism along the axis is commonly less than one kilometer wide and is flanked by 1-to-2-km wide regions of vigorous tectonic and minor volcanic activity (Normark, 1976). Active hydrothermal vents with fluid temperatures of 350° to 400° C precipitate large pads of massive metal-sulfide deposits in the active volcanic zone (Spiess et al., in press), and metal-sulfide deposits without active hydrothermal discharge were discovered in the flanking tectonically active regions (Francheteau et al., 1979).

Figures 2 and 3 are detailed bathymetric maps that were compiled for two major submersible studies of the EPR axial region. In 1978, the French submersible CYANA was primarily used to study the northern half of the area shown in Figure 2 (Francheteau et al., in press). The base map for the CYANA dives was prepared at 1:10,000 scale with 10 m bathymetric contours (Normark et al., 1978). The map contoured at a 10 m shown interval in Figure 3 was the base map used for the RISE expedition submersible studies with the DSRV ALVIN in 1979 (Spiess et al., in press). The bathymetry shown in Figure 2 is a simplification of the 1:10,000-scale base maps used for both submersible studies.

All bathymetric data used for these maps is based on narrow-beam echo-sounding with the deep-tow instrument of the Marine Physical Laboratory of Scripps Institution of Oceanography (Spiess et al., 1976). Three separate surveys were involved in the data collection: expedition COCOTOW in September, 1974; expedition FRANCIS DRAKE in June, 1977; and expedition RISE in April, 1979. All three operations were funded through Scripps Institution of Oceanography and used their ship, R/V MELVILLE. The sounding data for the COCOTOW and F. DRAKE surveys were digitized from analog records with a precision of ± 2 meters for a total of 9700 sounding points. The RISE sounding data were recorded in digital format initially with somewhat improved precision and a continuous record from the one-second-sounding interval.

Positioning for the deep-tow vehicle uses bottom-anchored acoustic transponders. Positions are accurate within 5 to 10 m for each survey, and each survey utilizes 1200 to 1400 positions. Unfortunately, there were no common transponders between the surveys. The overlapping COCOTOW and F. DRAKE surveys were matched using distinctive topographic features recorded on side-scanning sonar records and on bottom photographs. The RISE survey data were then fitted to the earlier bathymetric map by matching prominent and distinctive topographic features. Few depth discrepancies exist at track crossings between the various surveys, and the final match is probably accurate to 25 m or less in a horizontal sense.

Both the transponder range data and the echo-sounding data were corrected for sound-velocity variations in sea water using temperature, salinity, and depth data obtained with a CTD sensor on the deep-tow instrument and the sound velocity relation of Wilson (1960).

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